DOCUMENT RESUME

ED 149 928 RC 010 352

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TITLE Predicting Success of High School Freshmen in Algebra I in the Small Rural High School.
PUB DATE 78
NOTE 9p.

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Algebra; Aptitude Tests; Freshmen; Grade 9; *High School Students; Performance Factors; *Predictor Variables; *Rural Schools; Secondary School Mathematics; *Small Schools; *Success Factors

ABSTRACT

Utilizing data compiled from records of 33 students who had completed Algebra I in 1974 and 1976, the study examined the California Algebra Aptitude Test (CAAT) and other possible predictors of success for freshmen students entering Algebra I in a small rural high school. The CAAT and the Iowa Test of Basic Skills (ITBS) were taken by these students as 8th graders. Possible predictors of Algebra I success analyzed were final mathematics grades, elements of the student's family and home background, sex, and the CAAT and ITBS scores. The Algebra I grade was used as the criterion variable. Data were analyzed using a stepwise forward regression procedure. It was found that the eighth grade mathematics grade which accounted for 45% of the variance of the Algebra I grade was the best predictor of success, and that the CAAT scores had little real prediction value. The first five predictor variables were math grade, sex, ITBS Math Concepts, ITBS Map Reading, and mother (does not work outside the home) which collectively accounted for over 66% of the variance in the Algebra I grade. (NQ)

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rec 21-02-78

ED149928

PREDICTING SUCCESS OF HIGH SCHOOL FRESHMEN IN ALGEBRA I IN THE SMALL RURAL HIGH SCHOOL

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1978

Abstract

This research examined several possible predictors of success for freshmen students entering Algebra I. A multiple linear regression technique was used and identified the eighth grade math grade as the best predictor for success.

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INTRODUCTION

Accurate placement of high school freshmen students in the proper math program can provide the students with a positive experience. If frustrations can be avoided the students may well enjoy more adequate feelings of success and thereby experience a more rewarding introduction to their high school careers.

The counselor and faculty in a small, high school in South Dakota were interested in determining whether students were being adequately assessed in the determination of placement in Algebra I. The existing procedure for placement was to administer the California Algebra Aptitude Test (CAAT, 1958) and use the students' score as a criterion of placement into either algebra or general mathematics.

Because of the very general nature of the CAAT the present investigators questioned its predictive validity in the Algebra I placement procedure. Other questions were raised concerning the actual need for such an instrument in that other predictors were available which might in fact provide the counselor with equally valid placement information.

The foregoing questions had been raised in other studies. Hanna, Bligh, Lenke & Orleans (1969) found that eighth grade averages were statistically significant in predicting success in algebra. In a similar study, Mogull and Rosengarten (1972) found that eighth grade mathematics averages were statistically superior (to more objective and elaborate devices such as the Iowa Algebra Aptitude Test and the Differential Aptitude Test in predicting success in Algebra I.

With the potential of eliminating a procedure which might have been subjecting students to unnecessary testing, and accompanying frustration as well as additional unnecessary expense to the local school district, the investigators implemented the present study to see whether the original speculations and/or the findings of the above-mentioned research efforts were valid in the case of this one small rural high school population.

Method

This study was conducted with data compiled from the records of students who had completed Algebra I in 1974 and 1976 (data was unavailable for the 1975 group). The California Algebra Aptitude Test (CAAT) and the Iowa Tests of Basic Skills (ITBS) were taken by these students when they were enrolled in eighth grade. Other possible predictors of Algebra I success analyzed included final mathematics grades and elements of the students' family and home backgrounds.

Subjects. The research population used for this study included those students who as high school freshmen took algebra in the years 1974 and 1976, and for whom complete data was available. This population included 33 students of which 22 were female and 11 male.

Variables. Table 1 contains the variables analyzed in this study. The Algebra I grade was used as the criterion variable, while all other listed variables were used as predictors of success.

Table 1 goes about here

Procedure. Data for this study was analyzed using a stepwise forward regression procedure, (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975). The stepwise forward regression process is a descriptive

multiple linear regression technique, which begins with k (n-1 maximum) predictor variables and the one criterion variable, (in the present case Algebra I grade was used as the criterion variable). The one predictor that contributes most to the prediction of the criterion variable level is identified first and each succeeding step adds the next best predictor from the remaining predictor variables. The variable to be added at each step is chosen on the basis of providing the largest gain in the multiple correlation coefficient (R).

Results

The order of predictors was presented in Table 2. Of all considered

Table 2 goes about here

predictor variables, eighth grade mathematics grade was identified as the best single indicator of success in Algebra I. This variable accounted for 45% of the variance of the Algebra I grade.

The first five predictor variables listed by the stepwise forward regression included (a) math grade, (b) sex, (c) ITBS Math Concepts, (d) ITBS Map Reading, and (e) Mother (does not work outside the home) which collectively accounted for over 66% of the variance in these students' algebra grade. The next twelve predictor variables that appeared in the regression analysis were significant, but indentified a minimal amount of additional variance in the total prediction equation. It should be noted that only four of the seven CAAT scores were included (see 9, 10, 11, & 14th positions) in this grouping.

Those variables not reported in the table included the CAAT predictor variables of composite I, composite F & S, and composite P & S along with capitalization and the language total from the ITBS. Although these predictor variables did have a significant correlation when analyzed

separately ($p<.05$), The variation identified was apparently, more adequately isolated by precedent variables. In other words any predictive validity of these variables could be accounted for in the other predictors (e.g. eighth grade mathematics grade and ITBS mathematics) as indicated in this regression analysis.

Discussion

The purpose of this study was to determine if the California Algebra Aptitude Test or some other available predictor variable might be used by the small rural high school counselor to more accurately predict success in freshmen algebra. This study revealed that the eighth grade mathematics grade was the best predictor of success in the present situation. It also determined that the CAAT scores had little real prediction value. Although many of the considered predictor variables had significant correlation with Algebra I success, they added little value to the prediction when used in the regression equation.

It should be noted that this study was in concert with the findings of Hanna et al. (1969) and Mogull & Rosengarten (1972) and it seems evident that the eighth grade mathematics grade continues to be one of the better indicators of success in high school algebra.

References

Hanna, G.S., Bligh, H.F., Lenke, J.M., & Orleans, J.B. Predicting algebra achievement with an algebra prognosis test, IQS, teacher predictions, and mathematics grades. Educational and Psychological Measurement, 29 (4) 903-907.

Keys, N., & McCrum, M. California algebra aptitude test, Circle Pines, Minnesota: American Guidance Service, 1958.

Mogull, R.G., & Rosengarten, W. Predicting success in elementary algebra. California Journal of Educational Research, 1972, 23 (3), 104-107.

Nie, N.H., Hull, C.H., Jenkins, J.G., Steinbrenner, K., & Brent, D.H. SPSS; Statistical package for the social sciences (2nd ed.). New York: McGraw-Hill, 1975.

University of Iowa. Iowa test of basic skills; Level 8; Form 6. Boston: Author (Houghton Miflin), 1972.

TABLE 1

DESCRIPTION OF VARIABLES

Variable Name	Description	Code*
Algebra I	Algebra I grade earned by student	4=A,3=B,2=C,1=D
Sex		0=Female, 1=Male
Math Grade	Eighth grade math grade	4=A,3=B,2=C,1=D
Mother	Does mother work outside the home	0=Yes, 1=No
Family	Is there an older brother or sister	0=Yes, 1=No
Home	Does student live in town or farm	0=Farm, 1=Town
CAAT Problems	Sub-section score on CAAT	
CAAT Formulas	Sub-section score on CAAT	
CAAT Series	Sub-section score on CAAT	
CAAT Comp I	Sum of problems, formulas, and series scores on CAAT	
CAAT Comp P & F	Sum of problems and formulas scores on CAAT	
CAAT Comp F & S	Sum of formulas and series scores on CAAT	
CAAT Comp P & S	Sum of problems and series scores on CAAT	
ITBS Vocabulary	Vocabulary scores from ITBS	
ITBS Reading	Reading score from ITBS	
ITBS Spelling	Spelling score from ITBS	
ITBS Capitalization	Capitalization score from ITBS	
ITBS Punctuation	Punctuation score from ITBS	
ITBS Usage	Usage score from ITBS	
ITBS Lang Total	Language total from ITBS	
ITBS Map Reading	Map reading score from ITBS	
ITBS Graphs	Graph usage score from ITBS	
ITBS Reference	Reference usage score from ITBS	
ITBS Work-Study	Work-study score from ITBS	
ITBS Math Concepts	Math concepts score from ITBS	
ITBS Problem Solving	Problem solving score from ITBS	
ITBS Math Total	Math Total from ITBS	
ITBS Composite	Composite score earned on ITBS	

* Continuous variables were coded by the score received on that particular inventory.

TABLE 2

STEPWISE FORWARD REGRESSION WITH ALGEBRA I GRADE AS THE CRITERION (N=33)

Step	Variable Added	Multiple R	R^2	F
1	Math Grade	.675	.455	25.9
2	Sex*	.745	.555	18.7
3	ITBS Math Concepts	.780	.607	14.9
4	ITBS Map Reading	.796	.634	12.1
5	Mother**	.813	.661	10.6
6	ITBS Problem Solving	.820	.672	8.89
7	ITBS Punctuation	.826	.682	7.67
8	Family	.833	.693	6.78
9	CAAT Problems	.838	.703	6.04
10	CAAT Formulas	.843	.711	5.41
11	CAAT Comp P & F	.859	.739	5.39
12	ITBS Composite	.868	.754	5.10
13	ITBS Reference	.872	.760	4.62
14	CAAT Series	.875	.765	4.19
15	ITBS Math Total	.878	.771	3.81
16	ITBS Work-Study	.881	.776	3.46
18	ITBS Usage	.889	.790	2.92
19	ITBS Vocabulary	.892	.796	2.67
20	ITBS Graphs	.894	.800	2.39
21	ITBS Reading	.895	.801	1.85

* Female students manifested significantly higher levels

** Students whose mothers did not work manifested higher achievement levels (not significant)